



FOOD AND DRUG

LABORATORY

OF THE

DEPARTMENT OF TRADE AND COMMERCE

OTTAWA, CANADA

BULLETIN No. 425

MINERAL WATERS

NOTES AND COMMENTS.

Under this heading, as occasion arises, the Bulletins issued by this Department will contain, as an appendix, such comment as may seem necessary or advisable upon matters relating to the work of the Department in connection with the administration of the Adulteration Act, the Fertilizers Act, the Feeding Stuffs Act or the Proprietary Medicines Act.

It frequently happens that correspondents ask information regarding the above Acts, of such a nature that the matter in question possesses general interest, and comment upon it would prove acceptable and useful to others than the immediate questioner. In such cases the reply may find a place in these columns. For convenience of reference these notes will be numbered in series.

A. MCGILL,

Chief Analyst.

FOOD AND DRUG.

LABORATORY

OF THE

DEPARTMENT OF TRADE AND COMMERCE

OTTAWA, CANADA

BULLETIN No. 425

MINERAL WATERS

MARCH 3, 1919.

F. C. T. O'HARA, Esq.,
Deputy Minister of Trade and Commerce,
Ottawa, Ont.

Sir,—I beg to enclose a report upon Mineral Waters of both domestic and foreign origin, as sold in Canada.

A number of complaints regarding this class of articles have been made during recent years. These claim that much substitution and imitation exist; and that incorrect and misleading description is found on the labels.

The investigation is attended with many difficulties and the report furnished herewith is, in my opinion, very creditable to Mr. Johnson, who has spared no pains to make it as complete as possible. He has received assistance in the analytical work from the analysts in charge at Halifax, Winnipeg and Vancouver; but the greater part of this work has been performed by himself.

We have in past years given a good deal of attention to domestic water supplies (Bulletins 5, 13, 15, 18, 51 and 149), but this is the first occasion upon which so-called Mineral Waters have been systematically examined. The report should interest both the public and the importer and producer; and may enable this department to formulate conditions for the regulation of this class of articles.

I beg to recommend its publication as Bulletin No. 425 of our series.

I have the honour to be, Sir,
Your obedient servant,

A. MCGILL,

Chief Analyst.

4

"Dr. A. MCGILL,
Chief Analyst,
Ottawa, Ont.

DEAR SIR,—I beg to submit herewith a report dealing with the examination of 138 samples of mineral water representing 62 brands purchased by our inspectors during September, 1918. Of these, 64 samples are Canadian waters and represent 33 brands.

Number of samples examined at	Halifax Sub-laboratory	16
"	Winnipeg Sub-laboratory	15
"	Vancouver Sub-laboratory	17
"	Ottawa Laboratory	90

This is the first collection of mineral water to be examined by this Department, the object being to determine whether there was any ground for the complaints that: (1) natural native mineral water and imported waters of reputation are being imitated by artificial solutions; (2) native waters have exaggerated therapeutic claims made for them and are therefore incorrectly described.

DEFINITIONS.

Mineral water has not yet been legally defined by the Canadian authorities. It will not be out of place, therefore, to briefly trace the changes to which the definition of mineral water has been subjected. Originally the term was restricted to signify a natural spring water used only for medicinal properties, which were attributed to the mineral constituents or gases, held in solution by the water. At the present time the term is given much wider interpretation. A more comprehensive definition is that adopted by the International Food Congress¹ held in Paris in 1909. "A mineral water is a natural water proposed for consumption on account of its special therapeutic or hygienic properties." This does not distinguish between mineral waters valued because of their medicinal qualities and "table waters" used chiefly on account of their purity or hygienic properties.

In order to limit the use of the word natural water as distinguished from artificial water, it is necessary to define the term. When a water laden with mineral matter and carbon dioxide issues from the earth, it will in a short time deposit iron and calcium salts and thus greatly alter in composition. Yet to all intents and purposes it is still a natural water. Considering such question as this the International Food Congress aforementioned adopted the following resolution: "A natural water is, from a commercial point of view, a water free from harmful germs, which at its place of origin, as it bursts from the ground, is directly placed in the same receptacle in which it is delivered to the consumer." They also specified that the term "table water" should be applied exclusively to natural waters and that the words "gaseous" or "aerated" should also imply a natural mineral water. Further it was decided that "all manipulations must be visibly indicated on the label affixed to the receptacle containing the water, in which receptacle it is delivered to the consumer."

According to the definition adopted by the Board of Food and Drug Inspection, (2) United States Department of Agriculture, a natural mineral water is a water that has had nothing added to it or abstracted from it after issuing from source.

ANALYTICAL DISCUSSION.

The examination consisted in checking some of the principal constituents to which the value of the water was attributed. This was limited in many cases where the amount of sample was very small. Whenever the label did not bear a statement of

¹ Compte rendu des travaux du 2e congrès international pour la répression des fraudes alimentaires et pharmaceutiques, Paris, 1909. U. S. Dept. of Agr., Bur. of Chem., Bul. 139 p. 9.

² U.S. Dept. of Agr., Bul. 139, p. 9, ref. made to Food Inspection Decision.

analysis, effort was made to obtain such from the manufacturer, failing which, recourse was made to the literature and the most recent available has been used for comparison. To expedite the work as much as possible, samples of the same brand and the same label were mixed and a representative amount examined. When two or more analyses have been made of one brand (same label), the published results are averages. Advertised and previous analyses when quoted are reported according to the general rules as given in Standard Methods ⁽¹⁾ of Water Analysis. Standard methods ⁽²⁾ have been used throughout. Advertised analyses and those found in various references have been calculated to their ions and expressed in parts per million (milligrams per litre) except in the case of silica ⁽³⁾ which is reported as such (SiO_2).

Calculation of hypothetical combinations has not been attempted for the reason that according to the modern theory of solution, it is believed that the elements are more or less, if not entirely, dissociated into electrically charged particles or ions and that they do not necessarily exist in the form of salts. "That such a combination (hypothetical) has no basis in fact is doubtless true, since we have every reason to believe that in cases where various acids and basic ions are present in solution, no base unites with any one acid to the exclusion of all other acids, or vice versa, but all possible combinations of the various basic and acidic ions in solution are formed to some extent." Over forty sets of rules⁴ exist for the calculation of hypothetical combinations; small wonder then that analyses of the same water by different commercial analysts do not always agree. These rules are all based on the respective solubilities of the component salts. "But these rules are based on false assumptions because the solubility of each salt when alone in solution is different from its solubility in a solution of other salts."⁵

The importance of having analyses stated in ionic form is readily seen from consideration of the following: If one part per million of lithium be present one can compute 5.3 parts of lithium carbonate, 6.1 parts of lithium chloride, 7.9 parts of lithium sulphate, 9.8 parts of lithium bicarbonate. If special therapeutic properties are attributed to the lithium content, it will exert those physiologic reactions in proportion to the amount of the lithium ion present. The layman interested, let us say, in the lithium as a diuretic and not concerned with the interpretation of the labelled analysis, will be under the impression that he is getting a water higher in lithium, when it is reported as lithium bicarbonate, than when it is stated in ionic form.

Many samples have a vague and unsatisfactory advertised analysis . . . that no statement is given to show in what terms the results are expressed. American authorities have decreed that all water results be stated in parts per million (milligrams per litre). Until the Canadian authorities adopt this system, it is suggested that this Department require that the terms in which advertised analyses are expressed, whether in grains per pint; grains per United States gallon; grains per Imperial gallon; grams per litre, be indicated on the label.

Most of the waters, having curative claims for them, bear an analysis; some exceptions to this, however, make it necessary to require that when therapeutic claims are made for the water, the receptacle in which it is sold to the consumer should bear a quantitative analysis. Or, that such an analysis be available upon request. In the absence of medicinal claims, as in the case of "table waters," freedom from

¹ Amer. Public Health Assn., 1917, p. 14.

² Jour. A. O. A. C., vol 2, part 2, p. 41.

³ "Whether silica exists in waters in combination as a soluble silicate or in colloidal form has not been definitely determined." (U.S. Dept. of Agr., Bul. 17.)

⁴ U.S. Dept. of Agr., Bul. 91, Bur. of Chem., p. 17.

⁵ Dept. of Mines, Bul. 26, Mineral Springs of Canada, part 2.

⁶ Turrentine. The Composition of U.S. Salines, Jour. Ind. Eng. Chem., 7, p. 689, 1915.

R. B. Dole, Hypothetical Combinations in Water Analysis, Jour. Ind. Eng. Chem., 6, p. 710, 1914.

pollution would seem to be the only requirement necessary. These statements apply more especially to waters of Canadian origin as foreign waters of reputation have been investigated repeatedly.

It will be noted that in the case of heavily mineralized waters, there is often a marked difference between some of the advertised analyses and those of these laboratories. Variations of this kind are often attributed to the amount of rain or snowfall. Through absorption from the air, of small quantities of nitric acid, carbon dioxide and ammonia, the solvent action of rain water is considerably increased. Haywood and Smith¹ summarize their study of Saratoga waters thus:—

(1) The waters are in nearly all cases markedly weaker in mineral content than they were about thirty-five years ago.

(2) There is a great variation in the total mineral content of individual springs from time to time.

(3) The rarer elements, such as lithium and bromin, seem to vary to a greater extent than the other elements present.

This would seem to explain many differences in the results obtained. Without a more complete analysis or intimate knowledge of the various sources, interpretation of results must, of necessity, be very cautious.

In formulating regulations to govern Canadian mineral waters, I would respectfully recommend:—

(1) That natural mineral water be defined.

(2) When medicinal claims are made for the water, that labels bear an analysis, expressed in parts per million and preferably in ionic form.

(3) That artificial or fortified waters be plainly so marked.

I have the honour to be, Sir,

Your obedient servant,

L. ERLE JOHNSON

Public Analyst.

AETNA MINERAL WATER

St. Sever Co., St. Maurice, Que.

Sample No. 8088

Constituents	Found	†Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	trace	trace	3.8
Bicarbonic acid.....(HCO ₃)	1,000	1,700	2,000
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			29
Nitrous acid.....(NO ₂)			.6
Phosphoric acid.....(PO ₄)		8	
Chlorine.....(Cl)	7,900	5,900	9,400
Bromine.....(Br)		4,400	15
Iodine.....(I)		77	9
Silica.....(SiO ₂)		78	37
Iron.....(Fe, Al)		370	14.3
Aluminum.....			
Manganese.....(Mn)		1.3	.1
Calcium.....(Ca)	90	38	71
Strontium.....(Sr)			4.8
Magnesium.....(Mg)	490	495	470
Lithium.....(Li)		17	3.8
Potassium.....(K)		258	170
Sodium.....(Na)		4,400	5,700
Ammonium.....(NH ₄)			23

†By F. Fafard, Laval University (1887).

*Dept. of Mines, Bul. 20, Part 2, p. 101 (1914).

RADIIUM MINERAL WATER

Vieuxville Springs, Montreal.

Sample No. 88610

Constituents	Found	†Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	3,000	2,000	2,300
Bicarbonic acid.....(HCO ₃)		400	640
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	3,600	2,500	3,500
Bromine.....(Br)			19
Iodine.....(I)		.03	.25
Silica.....(SiO ₂)		14	10
Iron.....(Fe, Al)			4.7
Aluminum.....			
Manganese.....(Mn)			.01
Calcium.....(Ca)	108	56	64
Strontium.....(Sr)			2.2
Magnesium.....(Mg)	86	63	96
Lithium.....(Li)			4
Potassium.....(K)		16	34
Sodium.....(Na)			3,400
Ammonium.....(NH ₄)		2,500	1.53

*Dept. of Mines, Bul. 20, Part 2, p. 77 (1914).

†Analysis made in 1899.

NOTE.—In view of the remarkable therapeutic properties attributed to the presence of radium or radium emanation in mineral waters, the radioactivity of Canadian mineral springs has been investigated by the Department of Mines. Regarding "Radium" water—"The radioactivity is low and no radium salts in solution could be detected, therefore, the bottled water after a few days will possess no radioactivity whatever. These results confirm those of Dr. McIntosh of McGill University, who found about as much radium emanation as is found in St. Lawrence River water." Elworthy, Department of Mines, Bul. 20, part 2, p. 78

SOURCE SEBASTIEN

Ste. Ursule, Que.

Sample No. 8067

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	traces	4,600	
Bicarbonic acid.....(HCO ₃)	1,500	1,500	
Carbonic acid.....(CO ₂)	none		
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		traces	
Chlorine.....(Cl)	4,600	130	
Bromine.....(Br)		12	
Iodine.....(I)		.01	
Silica.....(SiO ₂)		12	
Iron.....(Fe, Al)		1.05	
Aluminum.....}			
Manganese.....(Mn)			
Calcium.....(Ca)		64	
Strontium.....(Sr)			
Magnesium.....(Mg)		110	
Lithium.....(Li)			
Potassium.....(K)		110	
Sodium.....(Na)		2,500	
Ammonium.....(NH ₄)		18	
Solids dried at 100° C.....	8,900	9,100	

NOTE.—In the advertised analysis it is probable that chlorine has been calculated as sulphate.

SOURCE SAINT. JULIEN

St. Ursule, Que.

Sample No. 8066

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	9.2	21	
Bicarbonic acid.....(HCO ₃)	1,200	1,200	
Carbonic acid.....(CO ₂)	none		
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)		0.66	
Phosphoric acid.....(PO ₄)	present	224	
Chlorine.....(Cl)	2,300	2,100	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	2.4	41	
Iron.....(Fe, Al)		trace	
Aluminum.....}			
Manganese.....(Mn)			
Calcium.....(Ca)		31	
Strontium.....(Sr)			
Magnesium.....(Mg)		70	
Lithium.....(Li)			
Potassium.....(K)		6	
Sodium.....(Na)		1,800	
Ammonium.....(NH ₄)		8.3	
Solids dried at 100° C.....	4,800		

SAUGEEN NATURAL MINERAL WATER

Southampton, Ont.

Sample No. 88187

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	1,600	12	
Bicarbonic acid.....(HCO ₃)	110	320	
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	130	2.7	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		11	
Iron.....(Fe, Al)		12	
Aluminium }			
Manganese.....(Mn)			
Calcium.....(Ca)	520	57	
Strontium.....(Sr)			
Magnesium.....(Mg)	160	26	
Lithium.....(Li)			
Potassium.....(K)		3	
Sodium.....(Na)		9.5	
Ammonium.....(NH ₄)			

NOTE.—Advertised analysis submitted expressed in grains per gallon. In the absence of definite information on this point, Imperial gallon has been assumed (the water being of Canadian origin) and advertised analysis calculated on that basis. Considerable difference is evident in the sulphuric acid content.

GURD'S CALEDONIA WATER (NATURAL SALINE).

Caledonia Springs, Can.

Sample Nos. 9053-86806

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)			197
Bicarbonic acid.....(HCO ₃)	760		610
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			10
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			1.6
Chlorine.....(Cl)	3,800		5,400
Bromine.....(Br)			12
Iodine.....(I)			0.5
Silica.....(SiO ₂)			12.6
Iron.....(Fe, Al)			1.6
Aluminium }			
Manganese.....(Mn)			
Calcium.....(Ca)			83
Strontium.....(Sr)			10
Magnesium.....(Mg)			197
Lithium.....(Li)			1.6
Potassium.....(K)			67
Sodium.....(Na)			3,300
Ammonium.....(NH ₄)			2.8

*Analysis of Gurd's saline spring by Elworthy, Mines Branch Bul. 20, part 2, p. 56
NOTE.—No claims are made for this water either analytic or medicinal.

59734—2

SOURCE AUGUSTINS

Sample No. 86809

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	160	200	
Bicarbonic acid.....(HCO ₃)	700	4,500	
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		47	
Chlorine.....(Cl)	1,400	440	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	1.6	54	
Iron.....(Fe)		2.5	
Manganese.....(Mn)			
Calcium.....(Ca)	74	120	
Strontium.....(Sr)		1.7	
Magnesium.....(Mg)	trace	47	
Lithium.....(Li)		26	
Potassium.....(K)		140	
Sodium.....(Na)		1,700	
Ammonium.....(NH ₄)			

CARABANA MINERAL WATER

Spain

Sample Nos. 84397, 86803, 86945, 88314

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	50,000	70,000	
Bicarbonic acid.....(HCO ₃)			
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		12	
Chlorine.....(Cl)	2,400	1,500	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			
Iron.....(Fe)			
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	1,000	230	
Strontium.....(Sr)			
Magnesium.....(Mg)	1,000	740	
Lithium.....(Li)			
Potassium.....(K)			
Sodium.....(Na)			
Ammonium.....(NH ₄)			

NOTE.—In such a heavily mineralized water as this large variations are to be expected. Analysis of this water by the Academy of Medicine, Paris, 1855, and quoted by Ingram and Royle gives
 Total solids..... 228,000 parts per million
 Total solids (claimed on label)..... 108,000 parts per million

HUNYADI JANOS WATER

Budapest, Hungary

Sample Nos. 86727, 86408, 88313

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	27,000		33,000
Bicarbonic acid.....(HCO ₃)	330		1,300
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	740		1,000
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			12
Iron.....(Fe, Al)	10		18
Aluminium.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	470		200
Strontium.....(Sr)			110
Magnesium.....(Mg)	3,100		4,500
Lithium.....(Li)			
Potassium.....(K)			54
Sodium.....(Na)			8,100
Ammonium.....(NH ₄)			

*Bunsen—see p. 30. Ingram and Royle—"Natural Mineral Waters."

PERRIER TABLE WATER.

France.

Sample Nos. 80957, 88,107, 88,196.

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)		25	36
Bicarbonic acid.....(HCO ₃)	200		160
Carbonic acid.....(CO ₂)	18	200	trace.
Nitric acid.....(NO ₃)		trace.	
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	18	13	15
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		4.2	24
Iron.....(Fe, Al)		5	8.8
Aluminium.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)		130	210
Strontium.....(Sr)			
Magnesium.....(Mg)		6.5	3.1
Lithium.....(Li)			
Potassium.....(K)			
Sodium.....(Na)		21	12
Ammonium.....(NH ₄)			

*By Dr. H. Wilson Hake.

VERONICA WATER.

Santa Barbara, Cal.

Sample No. 88152.

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	16,000	12,000	12,000
Bicarbonic acid.....(HCO ₃)	1,100	1,100	1,000
Carbonic acid.....(CO ₂)	none	68	none
Nitric acid.....(NO ₃)		2,000	1,700
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		trace	trace
Chlorine.....(Cl)	2,300	1,800	2,000
Bromine.....(Br)			
Iodine.....(I)		trace	(a)
Silica.....(SiO ₂)		18	18
Iron.....(Fe, Al)	2.4	2.6	2.6
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	370	560	560
Strontium.....(Sr)			
Magnesium.....(Mg)	3,200	3,000	2,000
Lithium.....(Li)			
Potassium.....(K)		89	89
Sodium.....(Na)		2,000	2,100
Ammonium.....(NH ₄)			.08

*U.S. Dept. Agr. Bur. of Chem. Bul. 91, p. 35, 1907.

(a) Heavy trace.

BUFFALO LITHIA (SPRINGS) WATER.

Buffalo Lithia Springs, Va.

Sample Nos. 80847, 83151.

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	400	380	401
Bicarbonic acid.....(HCO ₃)	78		85
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			2.2
Nitrous acid.....(NO ₂)			trace
Phosphoric acid.....(PO ₄)	(a)	.30	(a)
Chlorine.....(Cl)	11	13	11
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	36	36	25
Iron.....(Fe, Al)		.06	5
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	250	180	170
Strontium.....(Sr)			
Magnesium.....(Mg)	7.4	6.7	6.4
Lithium.....(Li)	trace	trace	trace
Potassium.....(K)		trace	4
Sodium.....(Na)		20	31
Ammonium.....(NH ₄)			.088

*U.S. Dept. Agr., Bur. of Chem. Bul. 91, p. 44.

(a) Heavy trace.

POLAND WATER

South Poland, Mo.

Sample Nos. 88438, 88862, 88108, 88149a

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)		1.5	3.6
Bicarbonic acid..... (HCO ₃)	53		48
Carbonic acid..... (CO ₂)		21	
Nitric acid..... (NO ₃)			5.9
Nitrous acid..... (NO ₂)			.008
Phosphoric acid..... (PO ₄)			trace
Chlorine..... (Cl)	4.7	2.7	5
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)	30	19	24
Iron..... (Fe, Al)			.4
Aluminum..... (Mn)			
Manganese..... (Ca)	14	8.4	14
Calcium..... (Sr)			
Strontium..... (Mg)	1.6	2.7	2.1
Magnesium..... (Li)			trace
Lithium..... (K)		1.2	2.4
Potassium..... (Na)		2.9	6.9
Sodium..... (NH ₄)			.008
Ammonium.....			

*U. S. Dept. of Agr., Bur. of Chem. Bul. 91., p. 22. 1907.

CARLSBADER SPRUDEL (THERMAL)

Austria

Sample No. 70044

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	1700		1600
Bicarbonic acid..... (HCO ₃)	1800		
Carbonic acid..... (CO ₂)	48		700
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)	present		19
Chlorine..... (Cl)	630		610
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)	115		120
Iron..... (Fe, Al)			7.2
Aluminum..... (Mn)			
Manganese..... (Ca)			98
Calcium..... (Sr)			
Strontium..... (Mg)			13
Magnesium..... (Li)			
Lithium..... (K)			19
Potassium..... (Na)			1900
Sodium..... (NH ₄)			
Ammonium.....			

*By Gottl. see Walton—Mineral Springs p. 362

SAINT-YORRE SOURCE LUMIERE

Bassin de Vichy, France

Sample No. 86903

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....	(SO ₄) 160	220	
Bicarbonic acid.....	(HCO ₃) 3000	4700	
Carbonic acid.....	(CO ₂)		
Nitric acid.....	(NO ₃)		
Nitrous acid.....	(NO ₂)		
Phosphoric acid.....	(PO ₄)		
Chlorine.....	(Cl) 340	330	
Bromine.....	(Br)		
Iodine.....	(I)		
Silica.....	(SiO ₂)	15	
Iron.....	(Fe, Al)	10	
Aluminum.....			
Manganese.....	(Mn)		
Calcium.....	(Ca)	110	
Strontium.....	(Sr)		
Magnesium.....	(Mg)	13	
Lithium.....	(Li)	2.8	
Potassium.....	(K)	86	
Sodium.....	(Na)	1900	
Ammonium.....	(NH ₄)		

HATHORN WATER (Spring No. 2)

Saratoga Springs, N.Y.

Sample No. 88146

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....	(SO ₄)		13
Bicarbonic acid.....	(HCO ₃) 4,300		5,700
Carbonic acid.....	(CO ₂)		
Nitric acid.....	(NO ₃)		
Nitrous acid.....	(NO ₂)		
Phosphoric acid.....	(PO ₄)		
Chlorine.....	(Cl) 7,100		7,000
Bromine.....	(Br)		30
Iodine.....	(I)		3.8
Silica.....	(SiO ₂)		8.2
Iron.....	(Fe, Al) 18		16
Aluminum.....			
Manganese.....	(Mn)		trace
Calcium.....	(Ca) 910		970
Strontium.....	(Sr)		6.1
Magnesium.....	(Mg) 430		470
Lithium.....	(Li)		12
Potassium.....	(K)		440
Sodium.....	(Na)		4,400
Ammonium.....	(NH ₄)		18.1

*By Milford, Jour. Ind. and Eng. Chem. Aug. 1912, p. 594.

RED RAVEN SPLITS

Red Raven, Pa.

Sample Nos. 88671, 88725, 84399, 88147

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	870		670
Bicarbonic acid..... (HCO ₃)			280
Carbonic acid..... (CO ₂)			
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)	22,000		18,000
Chlorine..... (Cl)	80		100
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)			63
Iron..... (Fe, Al)			
Aluminum }			
Manganese..... (Mn)			
Calcium..... (Ca)			
Strontium..... (Sr)			
Magnesium..... (Mg)			
Lithium..... (Li)			
Potassium..... (K)			
Sodium..... (Na)			9,000
Ammonium..... (NH ₄)			

*U.S. Dept. Agr. Bur. of Chem. Bul 91, p. 66 (1907).

CONTREXEVILLE MINERAL WATER

Source du Pavillon, France

Sample Nos. 84395, 86330, 86426, 86946

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	1,300		1,300
Bicarbonic acid..... (HCO ₃)	280		240
Carbonic acid..... (CO ₂)			
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)			5
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)			14.9
Iron..... (Fe, Al)			1.36
Aluminum }			
Manganese..... (Mn)			
Calcium..... (Ca)	670		500
Strontium..... (Sr)			
Magnesium..... (Mg)	(a)		12
Lithium..... (Li)			0.07
Potassium..... (K)			3.1
Sodium..... (Na)			77
Ammonium..... (NH ₄)			
Arsenic..... (As-O ₃)	trace		trace

*Ingram and Royle "Natural Mineral Waters," 12th Ed. p. 31.

(a) Heavy Trace.

BETHESDA MINERAL WATER (CARBONATED)

Waukegan, Wis.

Sample No. 84400

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)			11
Bicarbonic acid.....(HCO ₃)	440		480
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			trace
Chlorine.....(Cl)	290		12
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			34
Iron.....(Fe)			3
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)			72
Strontium.....(Sr)			
Magnesium.....(Mg)			40
Lithium.....(Li)			
Potassium.....(K)			3.5
Sodium.....(Na)			17
Ammonium.....(NH ₄)			

*Analyses of Bethesda (natural) water by Prof. Chandler.

Note.—Difference in chlorine content satisfactorily accounted for.

WHITE ROCK WATER (LITHIATED)

Waukegan, Wisconsin.

Sample No. 68662, 80058, 88102, 88195

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	20	40	40
Bicarbonic acid.....(HCO ₃)		350	350
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)		7.9	4.4
Nitrous acid.....(NO ₂)			.03
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	230	290	430
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		12	12
Iron.....(Fe)	3	75	4
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	140	63	81
Strontium.....(Sr)			
Magnesium.....(Mg)	35	31	38
Lithium.....(Li)	30	48	12
Potassium.....(K)		3	3
Sodium.....(Na)		7.4	230
Ammonium.....(NH ₄)		.02	.04

*U.S. Dept. of Agr. Bur. of Chem., Bul. 91, p. 63 (1907).

AETNA MINERAL WATER (Bras)

St. Saver, Que.

No. 8073

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	trace		2.8
Bicarbonic acid..... (HCO ₃)	1,800		2,000
Carbonic acid..... (CO ₂)	95		
Nitric acid..... (NO ₃)			20
Nitrous acid..... (NO ₂)			6
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	9,400		9,400
Bromine..... (Br)			15
Iodine..... (I)			9
Silica..... (SiO ₂)			37
Iron..... (Fe, Al)			14.2
Aluminum..... (Fe, Al)			
Manganese..... (Mn)			1
Calcium..... (Ca)	84		71
Strontium..... (Sr)			4.8
Magnesium..... (Mg)	540		470
Lithium..... (Li)			3.8
Potassium..... (K)			0
Sodium..... (Na)			5,708
Ammonium..... (NH ₄)			23
Solids dried at 100° C.....	17,708		17,477†

*Dept. of Mines, Bul. 20, Pt. 2, p. 101 (1914). †Dried at 100°C.

STAR MINERAL WATER

St. Genesieve de Batiscan, Que.

Sample No. 8073

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)			2.9
Bicarbonic acid..... (HCO ₃)	650		1,100
Carbonic acid..... (CO ₂)		700	
Nitric acid..... (NO ₃)			6
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)		200	
Chlorine..... (Cl)	9,500	15,000	17,000
Bromine..... (Br)			34
Iodine..... (I)		45	7
Silica..... (SiO ₂)	22	26	11
Iron..... (Fe, Al)		14	37
Aluminum..... (Fe, Al)			
Manganese..... (Mn)			68
Calcium..... (Ca)	180	400	200
Strontium..... (Sr)		200	7.8
Magnesium..... (Mg)	570	820	800
Lithium..... (Li)		2	1.01
Potassium..... (K)		3.3	260
Sodium..... (Na)		7,800	9,100
Ammonium..... (NH ₄)			55
Barium..... (Ba)		54	
Solids—dried at 100°C.....	17,294	24,948	20,200†

*Dept. of Mines Bul. 20, part 2, p. 102 (1914).

†Dried at 110°C.

Note.—Star Water is claimed to "cure Rheumatism, Dyspepsia, Indigestion, Constipation, Debility, Headache, Blood Poison, Liver and Kidney, etc."

STAR SPRING MINERAL WATER

Sts. Genesien de Batiscan, Que.

Sample No. 8074

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)			2.9
Bicarbonic acid..... (HCO ₃)	1,100		1,100
Carbonic acid..... (CO ₂)	24		
Nitric acid..... (NO ₃)			.8
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	17,000		17,000
Bromine..... (Br)			24
Iodine..... (I)			7
Silica..... (SiO ₂)	8.4		11
Iron..... (Fe, Al)			27
Aluminium }			
Manganese..... (Mn)			.63
Calcium..... (Ca)	380		280
Strontium..... (Sr)			7.3
Magnesium..... (Mg)	1,000		280
Lithium..... (Li)			1.01
Potassium..... (K)			280
Sodium..... (Na)			9,100
Ammonium..... (NH ₄)			58
Solids dried at 100°C.....	20,730		20,280†

*Dept. of Mines, Bul. 20, Part 2, p. 102.

†Dried at 110°C.

DUNCAN APERIENT WATER (CONCENTRATED)

Caledonia Springs, Ont.

Sample Nos. 68712, 80309, 86331, 88801, 98125

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	58,000	72,000	3.4
Bicarbonic acid..... (HCO ₃)	680		1,300
Carbonic acid..... (CO ₂)	78	680	
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			1.2
Chlorine..... (Cl)	4,400	3,900	5,100
Bromine..... (Br)			10
Iodine..... (I)			1.8
Silica..... (SiO ₂)			11
Iron..... (Fe, Al)			1.56
Aluminium }			
Manganese..... (Mn)			.05
Calcium..... (Ca)	64	100	44
Strontium..... (Sr)			1.8
Magnesium..... (Mg)	9,000	11,000	145
Lithium..... (Li)			17
Potassium..... (K)			86
Sodium..... (Na)		17,000	3,300
Ammonium..... (NH ₄)			19.75
Specific gravity (average) at 15°C.....	1.0050		1.0073

*Analysis of Duncan Spring (1915) by Mines Branch, Bul. 20, part 2, p. 54.

DUNCAN LAXATIVE WATER (CONCENTRATED)

Caladenia Springs, Ont.

Sample Nos. 81377, 83864, 84364, 86413, 88864

Constituents	Found	Advertized	Previous* Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	53,000		3-4
Bicarbonic acid.....(HCO ₃)	790		1,300
Carbonic acid.....(CO ₂)	24		
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			1-2
Chlorine.....(Cl)	4,700		5,100
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			
Iron.....(Fe, Al)			36
Aluminum.....(Mn)			65
Manganese.....(Ca)	1,300		
Calcium.....(Sr)			
Strontium.....(Mg)	7,100		
Magnesium.....(Li)			
Lithium.....(K)			
Potassium.....(Na)			
Sodium.....(NH ₄)			10-75
Ammonium.....	1-0687		1-0673
Specific gravity (average at 15° C.).....			

*Analysis of Duncan Spring (1915) by Mines Branch, Bul. 20, part 2, p. 54.

Note.—Unable to obtain an advertised analysis of this water.

MAH-PU MINERAL WATER

Upstem, N.B.

Sample No 80205

Constituents	Found	Advertized	
	Parts per million	Parts per million	
Sulphuric acid.....(SO ₄)	1,300	1,400	
Bicarbonic acid.....(HCO ₃)			
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	3,800	3,500	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			
Iron.....(Fe, Al)			
Aluminum.....(Mn)			
Manganese.....(Ca)	770	1,100	
Calcium.....(Sr)			
Strontium.....(Mg)	70	16	
Magnesium.....(Li)	traces	39	
Lithium.....(K)	49	135	
Potassium.....(Na)	2,100	1,900	
Sodium.....(NH ₄)			
Ammonium.....	8,590	8,551	
Solids on evaporation.....			

Note.—The difference between lithium found and advertized is most significant. Label reads—
 "Nature's remedy for all kidney troubles, uric acid, diathesis, nausea, dyspepsia, rheumatism, sour
 stomach, internal disorders, gout, etc."

MANITOU MINERAL WATER

Watrous, Seal.

Sample No. 83070

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO_4)	16,000	6,000	
Bicarbonic acid.....(HCO_3)	280	700	
Carbonic acid.....(CO_2)			
Nitric acid.....(NO_3)			
Nitrous acid.....(NO_2)			
Phosphoric acid.....(PO_4)			
Chlorine.....(Cl)	6,000	12,000	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO_2)			90
Iron.....(Fe , Al)			4
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	370	440	
Strontium.....(Sr)			
Magnesium.....(Mg)	2,700	1,000	
Lithium.....(Li)			
Potassium.....(K)			750
Sodium.....(Na)			8,100
Ammonium.....(NH_4)			

Notes.—Considerable variation in this water. It would appear probable that sulphate has been calculated as chlorine in the advertised analysis.

ST. LEON MINERAL WATER (CONCENTRATED)

St. Leon Waters, Limited.

Sample No. 83193

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO_4)	7,800		41
Bicarbonic acid.....(HCO_3)	1,200		2,300
Carbonic acid.....(CO_2)	90		
Nitric acid.....(NO_3)			3
Nitrous acid.....(NO_2)			
Phosphoric acid.....(PO_4)			trace
Chlorine.....(Cl)	26,000		6,500
Bromine.....(Br)			25
Iodine.....(I)			2.5
Silica.....(SiO_2)	13		31
Iron.....(Fe , Al)			4.5
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	280		265
Strontium.....(Sr)			2.1
Magnesium.....(Mg)	1,500		307
Lithium.....(Li)			23
Potassium.....(K)			197
Sodium.....(Na)			4,000
Ammonium.....(NH_4)			30

*Analysis of St. Leon Spring (Lupien), Que., by Elworthy, Dept. of Mines, Bul. 20, Part 2, p. 96.

Notes.—Unable to obtain an advertised analysis of this water. Among other therapeutic claims labelled there is the following—"It (St. Leon Mineral Water) never fails to eliminate the uric acid from the blood".—"St. Leon water drunk warm will positively cure piles."

RIGA PURGATIVE WATER

Sample Nos. 88882, 81275, 83080, 83862, 84388, 86404, 86884, 88043, 88183

Constituents	Found	Advertised	Advertised Analysis converted to Parts per million
	Parts per million	Assumed grams per litre	
Sulphuric acid).....(SO ₄)	68,000	100	100,000
Bicarbonic acid.....(HCO ₃)	160	6.6	6,000
Carbonic acid.....(CO ₂)		11	110
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	3,000	1.02	1,000
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			
Iron.....(Fe, Al)			
Aluminum }			
Manganese....."			
Calcium.....			
Strontium.....			
Magnesium.....	trace	16	100
Lithium.....(Li)	8,800	9.3	9,300
Potassium.....(K)			
Sodium.....(Na)	18,000	62	52,000
Ammonium.....(NH ₄)			

Note.—Very large differences occur in this water. In the absence of definite information as to how results are expressed, the usual French custom of reporting in grams per litre has been assumed. "Highly recommended by the Physicians, Infallible for Dyspepsia, Fevers, Bilious Affections, Skin Diseases, Eczema, Rheumatism, Apoplexy, etc., etc." No statement on label as to whether it is a concentrated or fertifed water.

ABILENA MINERAL WATER

Walkerville, Ontario

Sample Nos. 88840, 88724, 81376, 83886, 86320, 86403, 86110, 86188

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	41,000	39,000	
Bicarbonic acid.....(HCO ₃)	260	260	
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)		7.1	
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	790	680	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	14	5	
Iron.....(Fe)	50	4.9	
Manganese....."			
Calcium.....	430	270	
Strontium.....			
Magnesium.....(Mg)	320	260	
Lithium.....(Li)			
Potassium.....(K)			
Sodium.....(Na)	18,000	18,000	
Ammonium.....(NH ₄)			

BYTHINIA MINERAL WATER

Sample No. 86430

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	19,000	17,000	
Bicarbonic acid.....(HCO ₃)	650		
Carbonic acid.....(CO ₂)		420	
Nitric acid.....(NO ₃)		3,300	
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	1,600	1,700	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		23	
Iron.....(Fe, Al)	34	21	
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	500	470	
Strontium.....(Sr)			
Magnesium.....(Mg)	4,100	4,100	
Lithium.....(Li)			
Potassium.....(K)		17	
Sodium.....(Na)		2,700	
Ammonium.....(NH ₄)			

VICHY ST. GEORGE

Pepinacville, Que.

Sample No. 86048

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	140	160	
Bicarbonic acid.....(HCO ₃)		2,300	
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		trace	
Chlorine.....(Cl)	4,400	4,400	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		26	
Iron.....(Fe, Al)		20	
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	350	230	
Strontium.....(Sr)			
Magnesium.....(Mg)	390	370	
Lithium.....(Li)		(a)	
Potassium.....(K)		71	
Sodium.....(Na)		3,000	
Ammonium.....(NH ₄)			

(a) Heavy Trace.

ADANAC WATER

The Caledonia Springs Co., Ltd.

Sample Nos. 80961, 88108

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)			5.7
Bicarbonic acid..... (HCO ₃)	76		
Carbonic acid..... (CO ₂)			45
Nitric acid..... (NO ₃)			20
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	14		10
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)			
Iron..... (Fe, Al)			
Aluminum }			
Manganese..... (Mn)			
Calcium..... (Ca)			24
Strontium..... (Sr)			
Magnesium..... (Mg)			2.2
Lithium..... (Li)			
Potassium..... (K)			
Sodium..... (Na)			19
Ammonium..... (NH ₄)			
Specific gravity at 15°C.....	1.0001		1.0002

*By Prof. T. A. Starkey, McGill University.

MAGI WATER

Caledonia Springs, Can.

Sample Nos. 80429, 80900, 88109, 88197

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)			2.1
Bicarbonic acid..... (HCO ₃)	940		930
Carbonic acid..... (CO ₂)			
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			trace
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	4,200		4,200
Bromine..... (Br)			10
Iodine..... (I)			1.6
Silica..... (SiO ₂)			15
Iron..... (Fe, Al)			1.4
Aluminum }			
Manganese..... (Mn)			
Calcium..... (Ca)	71		41
Strontium..... (Sr)			2.9
Magnesium..... (Mg)	170		140
Lithium..... (Li)			2.4
Potassium..... (K)			78
Sodium..... (Na)			2,700
Ammonium..... (NH ₄)			4.89
Total solids in solution residue dried at 100° C.....	7,818		7,762†

*Dept. of Mines Bul. 29—pt. 2, p. 47 (1915). †Dried at 110° C.

RADNOR MINERAL WATER

Radnor, Quebec

Sample Nos. 80959, 88101, 88189

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)		110	110
Bicarbonic acid.....(HCO ₃)	340	120	230
Carbonic acid.....(CO ₂)		120	
Nitric acid.....(NO ₃)			3.9
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			.01
Chlorine.....(Cl)	880	880	870
Bromine.....(Br)			1.7
Iodine.....(I)			
Silica.....(SiO ₂)		14	12
Iron.....(Fe, Al)		traces	4.7
Aluminum.....(Mn)			
Manganese.....(Ca)		180	97
Calcium.....(Sr)			
Strontium.....(Mg)		25	57
Magnesium.....(Li)			
Lithium.....(K)		10	14
Potassium.....(Na)		620	480
Sodium.....(NH ₄)			.02
Ammonium.....			1.0015
Specific Gravity at 15° C.....	1.0010		

*Dept. of Mines Bul. 20, pt. 2, p. 88 (1914).

SALUTARIS MINERAL WATER

St. Clair, Mich.

Sample No. 88148

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	27	traces	
Bicarbonic acid.....(HCO ₃)	650	180	
Carbonic acid.....(CO ₂)	none		
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	330	880	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	6.6	9.7	
Iron.....(Fe, Al)			
Aluminum.....(Mn)			
Manganese.....(Ca)		22	
Calcium.....(Sr)			
Strontium.....(Mg)		11	
Magnesium.....(Li)			
Lithium.....(K)		15	
Potassium.....(Na)		560	
Sodium.....(NH ₄)			
Ammonium.....			

NOTE.—The terms in which analysis advertised is expressed are not stated. Comparison is made on the assumption that grains per U. S. gallon are meant.

FRIEDRICHSHALL MINERAL WATER

Saxe-Meiningen, Germany.

Sample Nos. 84392, 86904

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	11,000		9,400
Bicarbonic acid.....(HCO ₃)	890		
Carbonic acid.....(CO ₂)	180		380
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	26,000		7,700
Bromine.....(Br)			85
Iodine.....(I)			traces
Silica.....(SiO ₂)			
Iron.....(Fe, Al)			
Aluminum.....(Mn)			
Manganese.....(Ca)	500		400
Calcium.....(Sr)			
Strontium.....(Mg)	2,000		2,300
Magnesium.....(Li)			
Lithium.....(K)			90
Potassium.....(Na)			5,100
Sodium.....(NH ₄)			
Ammonium.....			

*Calculated from analysis in Eaux Douces et Eaux Minérales by F. Dienert (1912).

HELENE QUELLE

Pyrmont, Germany

Sample No. 68678

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	30		1,100
Bicarbonic acid.....(HCO ₃)			470
Carbonic acid.....(CO ₂)			44
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			trace
Chlorine.....(Cl)	570		110
Bromine.....(Br)			trace
Iodine.....(I)			trace
Silica.....(SiO ₂)			31
Iron.....(Fe, Al)			12.8
Aluminum.....(Mn)			
Manganese.....(Ca)	440		1.2
Calcium.....(Sr)			570
Strontium.....(Mg)	240		2.1
Magnesium.....(Li)			110
Lithium.....(K)			12
Potassium.....(Na)			6.9
Sodium.....(NH ₄)			71
Ammonium.....			1.13

*By Fresenius in "Untersuchung des Wassers," p. 393 (1889).

FRANZ JOSEF APERIENT WATER

Hungary

Sample Nos. 80206, 84398, 88191

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	28,000	36,000	37,000
Bicarbonic acid..... (HCO ₃)			
Carbonic acid..... (CO ₂)			1,100
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	880		1,300
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)			12.4
Iron..... (Fe, Al)			6.3
Aluminum..... (Mn)			
Manganese..... (Ca)	600		540
Calcium..... (Sr)			
Strontium..... (Mg)	4,200	5,000	5,300
Magnesium..... (Li)			
Lithium..... (K)			
Potassium..... (Na)	5,450	8,000	8,200
Sodium..... (NH ₄)			
Ammonium.....			

*By Prof. Attfield quoted in "Natural Mineral Waters" by Ingram and Royle (1911), p. 26.

RUBINAT MINERAL WATER

Condal Spring, Spain

Sample Nos. 80207, 86329, 86407, 88105

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid..... (SO ₄)	33,000	67,000	66,000
Bicarbonic acid..... (HCO ₃)	410		
Carbonic acid..... (CO ₂)			
Nitric acid..... (NO ₃)			
Nitrous acid..... (NO ₂)			
Phosphoric acid..... (PO ₄)			
Chlorine..... (Cl)	1,000	1,210	1,200
Bromine..... (Br)			
Iodine..... (I)			
Silica..... (SiO ₂)			
Iron..... (Fe, Al)		36	
Aluminum..... (Mn)			
Manganese..... (Ca)	510	560	570
Calcium..... (Sr)			
Strontium..... (Mg)	1,900	640	650
Magnesium..... (Li)			
Lithium..... (K)	280	100	100
Potassium..... (Na)	12,000	31,000	32,000
Sodium..... (NH ₄)			
Ammonium.....			

* "Natural Mineral Waters," Ingram and Royle (1911) p. 45, analysis of the Rubinat-Llorach Spring by Prof. Bouchardat.

SAINT RENE (St-Yonnes near Vichy)

Bassin de Vichy, France

Sample No. 86943

Constituents		Found	Advertised	Previous Analysis
		Parts per million	Parts per million	Parts per million
Sulphuric acid.....	(SO ₄)	110	100	
Bicarbonic acid.....	(HCO ₃)	4,100	4,600	
Carbonic acid.....	(CO ₂)			
Nitric acid.....	(NO ₃)			
Nitrous acid.....	(NO ₂)			
Phosphoric acid.....	(PO ₄)			
Chlorine.....	(Cl)	250	230	
Bromine.....	(Br)			
Iodine.....	(I)			
Silica.....	(SiO ₂)	9.2	14	
Iron.....	(Fe, Al)	14	Fe=120	
Aluminum.....				
Manganese.....	(Mn)			
Calcium.....	(Ca)	280	180	
Strontium.....	(Sr)			
Magnesium.....	(Mg)	trace	12	
Lithium.....	(Li)			
Potassium.....	(K)		120	
Sodium.....	(Na)		1,600	
Ammonium.....	(NH ₄)			

WEST BADEN SPRUDEL WATER

West Baden, Indiana

Sample No. 84396

Constituents		Found	Advertised	Previous Analysis
		Parts per million	Parts per million	Parts per million
Sulphuric acid.....	(SO ₄)	53,000	62,000	
Bicarbonic acid.....	(HCO ₃)			
Carbonic acid.....	(CO ₂)		190	
Nitric acid.....	(NO ₃)			
Nitrous acid.....	(NO ₂)			
Phosphoric acid.....	(PO ₄)			
Chlorine.....	(Cl)	2,100	1,500	
Bromine.....	(Br)			
Iodine.....	(I)			
Silica.....	(SiO ₂)		8	
Iron.....	(Fe, Al)			
Aluminum.....				
Manganese.....	(Mn)			
Calcium.....	(Ca)	800	610	
Strontium.....	(Sr)			
Magnesium.....	(Mg)	6,600	6,500	
Lithium.....	(Li)			
Potassium.....	(K)			
Sodium.....	(Na)		18,000	
Ammonium.....	(NH ₄)			

NOTE.—Analysis of West Baden Springs, Ind., quoted by Walton in his "Mineral Springs" (1892) gives total solids 3,380 per million; Labelled analysis of sample, total solids, 53,815 per million. "Concentrated" or "fortified" does not appear on label.

SAINT LOUIS MINERAL WATER (No. 3)

St-Yorre pres Vichy, France

Sample No. 96806

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	160	150	
Bicarbonic acid.....(HCO ₃)	4,400	4,800	
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)		trace	
Chlorine.....(Cl)	230	230	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		26	
Iron.....(Fe, Al)		9.7	
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	130	140	
Strontium.....(Sr)			
Magnesium.....(Mg)	trace	42	
Lithium.....(Li)		2.9	
Potassium.....(K)		110	
Sodium.....(Na)		1,700	
Ammonium.....(NH ₄)			

APENTA APERIENT WATER

Budapest, Hungary

Sample Nos. 68726, 80206, 88192

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	20,000		21,000
Bicarbonic acid.....(HCO ₃)			
Carbonic acid.....(CO ₂)			510
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	920		1,100
Bromine.....(Br)			8.5
Iodine.....(I)			
Silica.....(SiO ₂)			32
Iron.....(Fe, Al)			53
Aluminum }			
Manganese.....(Mn)			
Calcium.....(Ca)	510		820
Strontium.....(Sr)			
Magnesium.....(Mg)	4,500		4,300
Lithium.....(Li)			9.5
Potassium.....(K)			37
Sodium.....(Na)	5,700		6,300
Ammonium.....(NH ₄)			

* "Natural Mineral Waters" by Ingram & Royle, p. 9, analysis by Tichborne.

VICHY CELESTINS

Vichy, France

Sample Nos. 88628, 88629, 83995, 84393, 88627, 86186

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	210		180
Bicarbonic acid.....(HCO ₃)			
Carbonic acid.....(CO ₂)			2,300
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	270		210
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	24		40
Iron.....(Fe, Al)			traces
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	170		200
Strontium.....(Sr)			
Magnesium.....(Mg)	33		20
Lithium.....(Li)			3-7
Potassium.....(K)	34		130
Sodium.....(Na)	1,600		1,600
Ammonium.....(NH ₄)			

**Eaux Douces et Eaux Minérales" by Dienart (1912) Table 2.

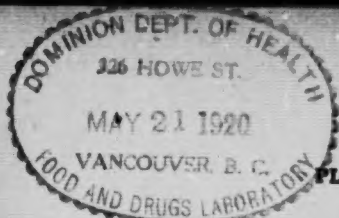
APOLLINARIS MINERAL WATER

Rhenish Prussia

Sample Nos. 88677, 80210, 83993, 86104

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	220		170
Bicarbonic acid.....(HCO ₃)	2,100		2,500
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			270
Chlorine.....(Cl)	220		170
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)			30
Iron.....(Fe)			26
Manganese.....(Mn)			
Calcium.....(Ca)	50		90
Strontium.....(Sr)			
Magnesium.....(Mg)	130		140
Lithium.....(Li)			
Potassium.....(K)			
Sodium.....(Na)	800		800
Ammonium.....(NH ₄)			

*Analysis in parts per million calculated from those given in Mineral and Aerated Waters by C. A. Mitchell, expressed in grains per pint. Analysis by Kyll (1907).



30

PLUTO CONCENTRATED SPRING WATER

French Lick, Ind., U.S.A.

Sample Nos. 68639, 68672, 68714, 80294, 81374, 83063, 83991, 84390, 86400, 86923, 88184

Constituents	Found	Advertised	*Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	68,000	70,000	68,000
Bicarbonic acid.....(HCO ₃)	240	240	220
Carbonic acid.....(CO ₂)			
Nitric acid.....(NO ₃)			trace
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	1,400	1,300	1,400
Bromine.....(Br)			
Iodine.....(I)			trace
Silica.....(SiO ₂)	28	13	29
Iron.....(Fe, Al)			3.5
Aluminum.....(Al)			
Manganese.....(Mn)			
Calcium.....(Ca)	540	520	390
Strontium.....(Sr)			
Magnesium.....(Mg)	6,000	6,000	6,100
Lithium.....(Li)			(a)
Potassium.....(K)		17	260
Sodium.....(Na)	19,000	31,000	22,000
Ammonium.....(NH ₄)		5.7	

*U.S. Dept. of Agr. Bur. of Chem., Bul. 91, p. 65. (a) Heavy Trace.

REGENTE

St. Yorre pres Vichy, France

Sample Nos. 86405, 86414

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	67	250	
Bicarbonic acid.....(HCO ₃)	1,100	4,200	
Carbonic acid.....(CO ₂)		2,300	
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	120	340	
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)	16	19	
Iron.....(Fe)	10	9.1	
Manganese.....(Mn)			
Calcium.....(Ca)	14	100	
Strontium.....(Sr)			
Magnesium.....(Mg)	6.6	14	
Lithium.....(Li)	2.0	2.5	
Potassium.....(K)		170	
Sodium.....(Na)		1,700	
Ammonium.....(NH ₄)			
Arsenic.....(As ₂ O ₃)	1.0	1.5	

AESCULAP MINERAL WATER

Sample Nos. 6676, 6673 4

Constituents	Found	Advertised	Previous Analysis
	Parts per million	Parts per million	Parts per million
Sulphuric acid.....(SO ₄)	20,000	25,000	25,000
Bicarbonic acid.....(HCO ₃)			
Carbonic acid.....(CO ₂)		500	500
Nitric acid.....(NO ₃)			
Nitrous acid.....(NO ₂)			
Phosphoric acid.....(PO ₄)			
Chlorine.....(Cl)	1,700	1,600	1,600
Bromine.....(Br)			
Iodine.....(I)			
Silica.....(SiO ₂)		9.2	trace
Iron.....(Fe, Al)		23	Al ₂ O ₃ =35
Aluminium }			
Manganese.....(Mn)		21	31
Calcium.....(Ca)	660	610	610
Strontium.....(Sr)			
Magnesium.....(Mg)	4,300	3,500	3,500
Lithium.....(Li)			
Potassium.....(K)		4.7	trace
Sodium.....(Na)		6,100	6,100
Ammonium.....(NH ₄)		1.7	

*Analyses by Mohr found in Mineral and Aerated Waters by C. A. Mitchell expressed in grains per pint are recalculated.

SEBASTIEN SPRING WATER

No. 8060

Ste. Ursule, Que.

Sulphuric acid.....(SO ₄)	trace		
Bicarbonic acid.....(HCO ₃)	330 parts per million		
Carbonic acid.....(CO ₂)	30	"	"
Chlorine.....(Cl)	1,400	"	"
Total solids dried at 100°C.	3,760	"	"

SAINT JULIEN SPRING WATER

No. 8070

Ste. Ursule, Que.

Sulphuric acid.....(SO ₄)	5.3 parts per million		
Bicarbonic acid.....(HCO ₃)	1,300	"	"
Carbonic acid.....(CO ₂)	84	"	"
Phosphoric acid.....(PO ₄)	trace		
Chlorine.....(Cl)	5,100	"	"
Silica.....(SiO ₂)	1.2	"	"
Total solids dried at 100°C.	8,000	"	"

MEYER'S MOUNT CLEMENS WATER

No. 84301

Mount Clemens, Mich.

Sulphuric acid.....(SO ₄)	27,000 parts per million		
Chlorine.....(Cl)	2,000	"	"
Calcium.....(Ca)	440	"	"
Magnesium.....(Mg)	4,300	"	"

NOTE.—Unable to obtain analysis of this water.

LITHIA WATER

No. 80201

Sussex, N.B.

No trace of lithium could be detected with the spectroscope after concentration of the whole sample (225 cc).

Total solids on evaporation.....	145 parts per million		
No therapeutic value is claimed for it.			

SOURCE GRANDE GROTTE (St-Yonne near Vichy)

No. 8474

Bassin de Vichy, France

Sulphuric acid.....(SO ₄)	120 parts per million		
Chlorine.....(Cl)	240	"	"
Iron.....(Fe)	0.05	"	"
Calcium.....(Ca)	310	"	"
Magnesium.....(Mg)	20	"	"

LANORAIE NATURAL MINERAL WATER

No. 8047, 8059.

Sulphuric acid.....	(SO ₄).....	89 parts per million
Bicarbonic acid.....	(HCO ₃).....	49 " "
Chlorine.....	(Cl).....	4,800 " "
Calcium.....	(Ca).....	45 " "

Note.—Unable to obtain an analysis of this water.

LAURENTIDE MINERAL WATER

No. 8043

Joliette, Que.

Chlorine.....	(Cl).....	5,300 parts per million
Sulphuric acid.....	(SO ₄).....	64 " "
Bicarbonic acid.....	(HCO ₃).....	24 " "
Calcium.....	(Ca).....	33 " "

Unable to obtain an analysis of this water. Medicinal claims on label—"Specific in rheumatism, dyspepsia, stomach and liver troubles—a universal beverage, mild laxative alterative and tonic." While only a very general statement of composition is made.

LA SOUVERAINE MINERAL WATER

No. 8090

Sulphuric acid.....	(SO ₄).....	190 parts per million
Bicarbonic acid.....	(HCO ₃).....	3,600 " "
Chlorine.....	(Cl).....	280 " "
Calcium.....	(Ca).....	41 " "
Magnesium.....	(Mg).....	heavy trace " "

Unable to obtain analysis of this water. Label reads "It is unequalled in all liver and stomach complaints, troubles of the bowels, diseases of the kidneys, diabetes, gout, rheumatism, dyspepsia, etc. About two bottles a day may effect the same cure at home as a prolonged stay at Vichy."

SUTHERLAND'S LITHIA WATER

No. 86194

Hamilton, Ont.

Total solids dried at 100° C.....		804 parts per million
Chlorine.....	(Cl).....	30 " "
Lithium.....	(Li).....	present

Sample very small. The manufacturers have not had an analysis made although they claim (on label) it to be "Useful in dyspepsia, rheumatism, kidney and all bladder troubles."

EAU MINERALE

No. 8085

St. Felix de Valois, Que.

Chlorine.....	(Cl).....	4,600 parts per million
Sulphate.....	(SO ₄).....	69 " "
Calcium.....	(Ca).....	62 " "
Lithium.....	(Li).....	present " "
Magnesium.....	(Mg).....	

This water is fortified with common salt and lithia salt "faite avec l'eau des sources de Ramsay" is prominent on label. No medicinal claims made for it.

LOUISEVILLE NATURAL MINERAL WATER

No. 8054

Louiseville, Que.

Chlorine.....	(Cl).....	3,300 parts per million
Bicarbonic acid.....	(HCO ₃).....	830 " "

Unable to obtain analysis of this water; no therapeutic claims made for it.

CORONA PURGATIVE WATER

No. 86305

Montreal, Que.

Sulphuric acid.....	(SO ₄).....	118,000 parts per million
Magnesium.....	(Mg).....	30,000 " "

Statement on label reads—"Corona Purgative Water is not an artificial water. Its medicinal and purgative properties are universally known, etc."

Statement in letter from manufacturer reads—"The formula for Eau Purgative Corona was given to Ottawa under No. 2559, etc., etc."

ST. CATHARINES MINERAL WATER

No. 88150

St. Catharines, Ont.

Sulphuric acid.....	(SO ₄).....	380 parts per million
Chlorine.....	(Cl).....	7,200 " "
Calcium.....	(Ca).....	1,900 " "
Magnesium.....	(Mg).....	210 " "

There is an advertised analysis of this water but expression of results is not made clear. Water is claimed to be "For medicinal purpose only."

ism,
the

each
etc.
aged

(on

ey"

and
to

is